

What is claimed is:

1. An apparatus for detecting a rollover of a vehicle,
comprising:
 - 5 a first detector detecting a roll angular velocity of the vehicle;
 - a memory unit memorizing a value of the roll angular velocity detected by the first detector;
 - a first calculator calculating a predictive value to the roll
10 angular velocity to be expected when a predetermined period of time elapses, by using a past value of the roll angular velocity of the vehicle, the past value being memorized in the memory unit; and
 - a rollover determination unit determining whether or not
15 there is a possibility that the vehicle will make a rollover, on the basis of the predictive value to the roll angular velocity.
2. The apparatus according to claim 1, wherein the
first calculator configured to use the value to the roll angular
20 velocity to obtain a derivative of the roll angular velocity and to calculate the predictive value to the roll angular velocity using a Taylor's expansion of the derivative directed to a time instant when the predetermined period of time elapses.
- 25 3. The apparatus according to claim 1, comprising an acquiring unit acquiring a roll angle of the vehicle,
wherein the rollover determination unit is configured to perform the determination on the basis of a relationship
between a value of the roll angle and the predictive value to the
30 roll angular velocity.
4. The apparatus according to claim 3, wherein the
acquiring unit is either a unit detecting the roll angle of the
vehicle or a unit calculating the roll angle of the vehicle by
35 integrating the roll angular velocity.

5. The apparatus according to claim 3, wherein the rollover determination unit is configured to perform the determination in consideration of a relationship between the value of the roll angle and the value of the roll angular velocity.

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6. The apparatus according to claim 1, comprising a second calculator calculating a predictive value to the roll angle to be expected at a time instant when the predetermined period of time elapses, by using the predictive value to the roll angular velocity,

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wherein the rollover determination unit is configured to perform the determination on the basis of a relationship between the predictive value to the roll angle and the predictive value to the roll angular velocity.

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7. The apparatus according to claim 3, wherein the rollover determination unit has a two-dimensional map consisting of the roll angle and the roll angular velocity serving as two dimensions, boundary lines being set on the map to form a first region showing a possibility of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the determination by pointing at a point on the map, the point being defined by both the value of the roll angle and the value of the roll angular velocity.

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8. The apparatus according to claim 7, comprising a second detector detecting a lateral acceleration to be applied on the vehicle in a lateral direction of the vehicle;

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a third detector detecting a vertical acceleration to be applied on the vehicle in a vertical direction of the vehicle;

a second calculator calculating a difference value of the roll angular velocity using the value of the roll angular velocity memorized in the memory unit;

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a rollover mode determination unit determining a rollover mode of the vehicle based on at least one of the lateral

acceleration, the vertical acceleration, the difference value of the roll angular velocity, and the roll angular velocity; and

5 a controlling unit controlling positions of the boundary lines on the map depending on the mode of the rollover determined by the rollover mode determination unit.

9. The apparatus according to claim 7, comprising
a second detector detecting a lateral acceleration to be applied on the vehicle in a lateral direction of the vehicle; and
10 a controlling unit controlling positions of the boundary lines on the map depending on a level of the lateral acceleration detected by the second detector.

10. An apparatus for activating occupant protective
15 devices mounted on a vehicle, the occupant protective devices being plural in number and being mounted on both lateral sides of the vehicle, respectively, the apparatus comprising:
a roll angular velocity detector detecting a roll angular velocity of the vehicle;

20 an acquiring unit acquiring a roll angle of the vehicle;
a rollover determination unit performing a rollover determination whether or not there is a possibility that the vehicle will make a rollover, on the basis of a value of the roll angle and a value of the roll angular velocity;

25 an acceleration detector detecting a lateral acceleration to be applied on the vehicle in a lateral direction of the vehicle;

a side-impact determination unit performing a first side-impact determination determining whether or not there is a side impact applied on the vehicle on the basis of a value of the lateral acceleration detected by the acceleration detector
30 and a second side-impact determination whether or not the side impact occur on which lateral side of the vehicle on the basis of the value of the lateral acceleration; and

an activation control unit controlling activation of the
35 occupant protective devices, every device mounted on each lateral side of the vehicle, using results determined by at least

one of the rollover determination unit and the side-impact determination unit.

11. The apparatus according to claim 10, wherein the
5 acquiring unit is either a unit detecting the roll angle of the vehicle or a unit calculating the roll angle of the vehicle by integrating the roll angular velocity.

12. The apparatus according to claim 10, wherein the
10 activation control unit is configured

to control one or more devices of the plural occupant protective devices on the basis of a result of the first side-impact determination, the one or more occupant protective devices being mounted on a collision side of the
15 vehicle decided by the second side-impact determination and

to control remaining one or more devices of the plural occupant protective devices on the basis of a result of the rollover determination, the one or more remaining occupant protective devices being mounted on a non-collision side of the
20 vehicle decided by the second side-impact determination.

13. The apparatus according to claim 12, wherein
the rollover determination unit has a two-dimensional map consisting of the roll angle and the roll angular velocity
25 serving as two dimensions, boundary lines being set on the map to form a first region showing a possibility of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the rollover determination by pointing at a point on the map, the point
30 being defined by both the value of the roll angle and the value of the roll angular velocity and

the side-impact determination unit is configured to perform the first side-impact determination using a magnitude relation between the value of the lateral acceleration and a
35 predetermined threshold thereto.

14. The apparatus according to claim 10, wherein the activation control unit is configured

to control one or more devices of the plural occupant protective devices on the basis of at least one of a result of the first side-impact determination and a result of the rollover determination, the one or more occupant protective devices being mounted on a collision side of the vehicle decided by the second side-impact determination and

to control one or more remaining devices of the plural occupant protective devices on the basis of a result of the rollover determination, the one or more remaining occupant protective devices being mounted on a non-collision side of the vehicle decided by the second side-impact determination.

15. The apparatus according to claim 14, wherein the rollover determination unit has a two-dimensional map consisting of the roll angle and the roll angular velocity serving as two dimensions, boundary lines being set on the map to form a first region showing a possibility of a vehicle's rollover and a second region showing no possibility of the vehicle's rollover, and means for performing the rollover determination by pointing at a point on the map, the point being defined by both the value of the roll angle and the value of the roll angular velocity and

the side-impact determination unit is configured to perform the first side-impact determination using a magnitude relation between the value of the lateral acceleration and a predetermined threshold thereto.

16. The apparatus according to claim 15, wherein the boundary lines on the map are adjustable to positions closer to an origin of the map; and

the threshold to the lateral acceleration is adjustable to be lowered.

17. The apparatus according to claim 15, wherein

the rollover determination unit, including means for performing a further determination determining a magnitude relation between a difference value of a current value of the roll angular velocity from a value thereof detected last time and a predetermined value, is configured to make the rollover determination performing means perform the rollover determination additionally using a result performed by the further determination.

18. The apparatus according to claim 15, wherein the boundary lines on the map are adjustable to positions in a direction departing from an origin of the map.

19. The apparatus according to claim 10, comprising a rollover mode determination unit determining whether or not a mode of the rollover is a trip-over based on a generation direction of the lateral acceleration and a rotation direction of the roll angular velocity,

wherein the activation control unit, when the rollover mode determination unit determines that the mode of the rollover is the trip-over, controls the activation of the occupant protective device mounted on a non-collision lateral side of the vehicle on the basis of the result determined by the rollover determination unit, the non-collision lateral side being determined by the second side-impact determination.

20. The apparatus according to claim 10, wherein the occupant protective devices include a side airbag device to be inflated and deployed on an inside wall of a cabin of the vehicle and the activation control unit controls the activation of the side airbag device mounted on a non-collision lateral side of the vehicle on the basis of the result determined by the rollover determination unit, the non-collision lateral side being determined by the second side-impact determination.